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ABSTRACT

This bulletin reviews research and lists resources on sex differences in mathematics and science achievement in middle-grade students. Research is discussed in relation to the following points: (1) differences in boys' and girls' achievement or ability; (2) influence of math/science on students' futures; (3) interventions for middle-grade years; (4) opinions of researchers on biological factors; and (5) influences of social variables on girls' attitudes. Books and articles, curricula and instructional materials, advocacy resources, and resources to watch for are all listed, with an annotation describing each. Research references are also included. (MNS)

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Issues in Middle-Grade Education

GIRLS, MATH, AND SCIENCE

Research & Resources

The difference in girls' and boys' achievement in mathematics and science is a topic that has received a great deal of attention in both the popular and academic presses during the last decade. There is a wide spectrum of opinion as to whether differences in achievement are related to gender at all, or whether other phenomena account for the variance between the sexes. One fact seems indisputable: boys and girls achieve at relatively similar rates through the fifth grade level. Marked differences in achievement begin to appear during the middle grades, and these increase year by year (Maccoby & Jacklin, 1974).

Do Boys and Girls Differ in Achievement or Ability?

Few have tried to dispute the basic fact of discrepancy in the math achievement of boys and girls. The larger question of whether the discrepancy in achievement reflects an underlying difference in math ability is, however, much more controversial. In the late 1970s, the National Institute of Education funded a grants competition on the following research question: What are the major positive and negative factors in the study of mathematics that affect female participation, achievement, and career choice? The consensus of the large body of research emanating from the NIE grants was that the primary explanation for sex differences in math achievement is the difference in math course participation. Indeed, as Fennema (1977) pointed out, "What was being compared were not females and males but students who had studied mathematics 1–3 years in high school with students who had studied mathematics 2–4 years in high school" (p. 85).

Math/Science Is Key to Students' Futures

According to Sells (1974), competence in mathematics functions as a "critical filter" in society. The student who does not attain mastery of math concepts defaults on the chance for high-paying technological employment. College-bound students need a full four years of high school mathematics to survive the standard college calculus sequence, which is in turn a prerequisite for many college majors.

Courses in advanced mathematics have become a requirement for all undergraduates, even liberal arts majors, at many universities. Further, advancement even in the so-called "feminine" careers now depends on mathematical competence. For example, the social sciences, including education, require statistics and research design courses in higher degree programs. So does library science, which also demands computer skills. Thus, quantitative skill has become an element of what had previously appeared to be nonquantitative careers.

Students who select themselves out of math courses are thus closing off a wide range of future career and life options. Unfortunately, many girls, even those who have been identified as highly able, drop high school mathematics as soon as the courses become optional. One result has been underrepresentation of females in the most highly paid sectors of the labor force.

Considerably more attention has been paid to sex-related differences in math achievement than in science. To a large extent, according to Kavrell and Petersen (in press), "sex differences in quantitative ability are influential in the development of sex-related differences in science" (p. 2). Thus the math filter serves to "eliminate women from many fields, from chemistry, physics and engineering, to architecture and medicine" (Ernest, 1976, p. 3).

Computers are increasingly essential in math and science coursework, as well as in the social sciences and the humanities. Since computer science is a relatively new field, sex-role stereotyping has not had the opportunity to become deeply ingrained. Nonetheless, evidence of a growing perception of the computer as a male machine is rapidly beginning to mount (Lockheed & Frakt, 1984). The obvious relationship between computer competence and employability makes early intervention on behalf of girls particularly necessary, in order to give them direct computer experience. Kiesler, Sproull, and Eccles (1983) have pointed out that "girls like to use the computer, but not if they have to fight with boys to get a turn" (p. 48). On the other hand, when teachers "intervened and set up time-sharing rules, the girls spent as much time on the computer as the boys."

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The middle-grade years are particularly significant to science and mathematics studies, because they are the last years in which girls and boys retain similar attitudes toward science. In a 1981 study, Haertel, Walberg, Junker, and Pascarella concluded the following:

> **Since equality of educational opportunity and the fulfillment of human potential are important, both for society and individuals, it appears that the early adolescent years are formative of important traits related to science learning and attitudes, and are thus an appropriate stage for focusing educational efforts to bring about the greater attainment of these goals. (p. 339)**

Intervention Essential During Middle-Grade Years

In response to a questionnaire, approximately one-third of the members of the Association for Women in Mathematics reported that they were interested in mathematics by age 11. "Most of the others became interested early in secondary school" (Luchins & Luchins, 1980, p. 10).

Even though avoidance of math and science courses does not occur until high school, when such courses are no longer mandatory, the math filter subtly begins to sift girls out when they are in the middle grades. Summing up the themes that appear and reappear in the findings of several prominent researchers, Fox (1980) wrote:

> **Although boys and girls do not differ with respect to achievement as measured by arithmetic tests in elementary school or on reported enjoyment of mathematics as a school subject, by the seventh grade striking sex differences emerge, most noticeably among the gifted; and by tenth or eleventh grade, when mathematics course-taking becomes optional, boys persist in the study of mathematics more than girls do. (p. 196)**

By the high school level, then, negative attitudes toward math, and plans to exclude math and science electives, have been set, often irrevocably.

The middle-grade years are a uniquely favorable period for intervention, because girls' attitudes are still in flux, susceptible to judicious molding (Brush, 1980). Many young adolescent girls can still be convinced that math and science are enjoyable subjects, appropriate for females to study, and useful in attaining career goals. Once convinced, girls tend to take math and science courses, persevere, and achieve at a level not significantly lower than their male counterparts.

In order to be effective, intervention must be grounded in an understanding of the influences that cause girls to change their attitudes toward math and science. But it is important to remember that this change in attitude is, albeit important, only one of many highly significant changes that appear in the period known as early adolescence. "During adolescence," wrote Berryman (1983) in a report to the Rockefeller Foundation, "individuals are under simultaneous pressures to resolve sexual identities, form career preferences, and invest in training required to pursue their preferences. Scientific career interests and investments in high school mathematics are consistent with the development of masculine, but not feminine, identities" (p. 8).

Thus, occurring as it does in the midst of a maelstrom of physical, socio-emotional, and cognitive changes, the math filter phenomenon cannot be traced to a single cause. Rather, at the root of the matter is a complex combination of factors that do not operate equally on every individual (Kavrell & Petersen, in press). Biological and social influences have been cited by many researchers.

Researchers Disagree on Biological Factors

Within the past few years, some researchers have claimed biological difference between the sexes as a possible explanation for dissimilarities in math performance. A 1980 *Science* article by Benbow and Stanley seemed to claim a genetic basis for superior male achievement in math, based on the authors' study of mathematically precocious seventh graders. The article precipitated a flurry of controversy that received wide treatment in the popular press. Fellow researchers attacked Benbow and Stanley on every conceivable ground, criticizing the selection and recruitment of the sample population, the ages of the children studied, the perceived lack of attention to social influences, and the assumptions inherent in claiming that boys' and girls' mathematical training prior to seventh grade has been the same.

But the attack on Benbow and Stanley did not stem only from general outrage at their research design. Critics were eager to discredit the research because of the fear that if a solid biological foundation for sex-related differences in math achievement were found, all attempts to mitigate social influences would be abandoned as a lost cause. Benbow's often-quoted recommendation that "women would be better off accepting the differences" would seem to indicate that such fears were not entirely unfounded (Kolata, 1980, p. 1235).

Benbow and Stanley ended their article with this warning: "It. . . seems likely that putting one's faith in boy-versus-girl socialization processes as the only permissible explanation of the sex difference in mathematics is premature" (p. 1264). This basic warning, if viewed dispassionately, is correct. On the ground of academic freedom, no possible explanation of sex differences in math ability should be considered "impermissible." But even if genetic and therefore unchangeable differences in math ability between the sexes were eventually found, educators would still be duty-bound to help their male and female students reach their full potential. The emphasis, then, would be on developing new strategies to help girls master math and science.

A letter written by a group of scientists was among the many responses to Benbow and Stanley's research published in *Science* magazine. The six men and women concluded:

> **Benbow and Stanley have not shown heritability or innate sex-linked differences in mathematical ability. Even if they had, it would tell us nothing about how to boost the observed performance of girls in mathematics. The real issue is whether or not one wants to see such a change. Attempts to attribute this social difference to a biological difference that would then legitimize the social differences are fallacious at best. (Egelman, Alper, Leibowitz, Beckwith, Levine, & Leeds, 1981, p. 116)**

Most evidence indicates that researchers have not been successful in identifying unchangeable genetic factors that may be responsible for sex-related differences in math ability. For example, the previously undisputed idea that boys have superior spatial ability (a trait thought to be related to math achievement) has been called into question in recent years (Armstrong, 1980). Further, researchers have repeatedly failed to find evidence linking superior spatial ability in boys to X-chromosome inheritance (Boles, 1980).

One promising developmental hypothesis, propounded and tested by Waber (1977), linked early and late maturation, independent of sex, to differences in verbal and spatial abilities. Based on tests of 80 elementary and high school youngsters, Waber found that "late maturers performed better than early maturers on spatial ability tests, but early maturers did not perform better than late maturers on verbal ability tests" (p. 34). Thus, according to Waber, "since females mature earlier than males, these data support the thesis that rate of physical maturation is an important determinant of the sex difference in spatial (but not verbal) ability" (p. 35). In other words, the differences in mathematical ability between the sexes may be linked to the fact that females mature faster, on the average, than males. "Maturational rate," Waber concluded, "has been shown to be a more powerful determinant of individual differences than sex itself on a set of psychological abilities on which the sexes have been found to differ" (p. 37).

Despite Waber's promising research, evidence for the influence of biologically based factors on math achievement has yielded sometimes inconclusive, sometimes contradictory results. As yet, the literature on rate of maturation and hormonal influence on cognitive functioning is still in its infancy.

Social Influences Shape Girls' Attitudes

Research on social influences on math achievement has been somewhat more conclusive. Fennema and Sherman (1977) found that stereotyping of math as a male domain inhibits girls' course taking, and, in turn, their achievement. Fox (1981) discussed girls' future expectations and their perceptions of math's future usefulness as major influences in their eventual success in math classes. Several others have described the impact of girls' expectations on eventual success or failure, describing female students' attitudes in terms of "math anxiety" (Tobias, 1976), "mathophobia" (Lazarus, 1974), and "math avoidance" (Sells, 1974). This is a complicated issue, primarily because a student can be influenced not only by her own expectations, but also by the expectations of her parents, counselors, teachers, and peers.

Early adolescence is a period during which self-perception comes not only from within, but as a reflection of the perception of others. Fennema and Sherman (1977) found that adolescent girls have less positive perceptions of their parents' confidence in their ability in mathematics than do boys. Fox (1977) reported that counselors seldom encouraged girls to pursue mathematics, and sometimes directly discouraged them. Ernest (1976) said that 41% of his sample of teachers believed that males did better in mathematics. Not one among his sample believed that females did better.

And, of course, there is the all-important peer influence. At no other stage in human development is there a stronger pressure to conform than during the period of early adolescence. And peer pressure to conform to appropriate sex-role stereotypes is particularly strong during this period. Thus, if girls perceive math and science course participation as inappropriate to their gender, they are less likely to enroll.

Most evidence on the expectations issue indicates that in the middle grades, girls begin to lose confidence in their ability as math achievers, even when there are no sex-related differences in mathematics performance. Confidence in learning mathematics is positively correlated with both math achievement and math course selection (Fennema & Sherman, 1977). When girls begin to perceive themselves as mathematically incompetent, they become mathematically incompetent. But such perceptions are not inevitable.

With Proper Help, Girls Achieve in Math and Science

Mounting evidence indicates that attempts to counter girls' negative attitudes toward math and science can be successful. In schools where conscious efforts have been made to encourage girls to believe in their ability, to persevere in math and science sequences, and to regard math and science as sex-appropriate pursuits, differences in math and science achievement scores are negligible or nonexistent (Brush, 1980; Paulsen & Johnson, 1983).

The elimination or narrowing of achievement discrepancies by sex occurs in some schools, not in others (Fennema, 1981). Moreover, in the schools with no differences in boys' and girls' math and science achievement, someone is likely to have made a conscious effort to counteract negative influences.

Fennema (1980) has identified a number of specific ways that teachers can counter the pressures on girls to avoid mathematics. First, teachers can eliminate negative references to women as learners or doers of mathematics in their own conversations and remarks. Second, since more girls than boys report that they are anxious about mathematics, teachers can encourage potentially anxious students in order to alleviate the pressure of mathophobia. Third, teachers can overtly discourage their students from stereotyping mathematics as a male domain. And fourth, teachers can make certain that students are aware of the importance of mathematics competence in keeping career options open.

"For middle school girls," Brush (1980) reported, "changes in the degree to which they see mathematics as useful for their future lives... predict changes in course plans" (p. 98). In other words, it is important that educators intervene to impress girls with the pragmatic benefits that will result from the study of mathematics. Brush suggested several other intervention techniques, including creating a "relaxed atmosphere in mathematics classrooms"; devising "special programs for parents, teachers, and guidance counselors on the usefulness of mathematics"; and introducing new, nontraditional mathematics courses, such as "teaching algebra through the medium of social science experiments," into the curriculum (pp. 99–101).

The critical factor for these intervention techniques, as well as for the programs that are described in the resource

list at the end of this review, is timing. Girls must be reached in the middle grades, early enough to prevent the operation of the math and science filters. Once girls have opted out of the math sequence and are two years behind their male classmates in math experience, efforts to recruit women into math and science fields are doomed to failure.

Armstrong (1980) stated the case quite simply in the report of NIE's two-year "Women in Mathematics" study:

> **Participation in mathematics is mostly an issue of awareness. If parents, teachers and counselors understand and transmit to students the necessity of taking mathematics to keep their options open and if they have the same high expectations for women as they have for men, then a basis for equal opportunity in scientific and technical fields will exist—for** men **and** women. **(p. 31)**

In a dramatically expanding technological world, the pool of mathematically and scientifically talented individuals must also expand. If women are to be a part of that pool, attentiveness in the middle grades to girls' attitudes, achievement, and course selection is essential.

Resources

Books and Articles

Encouraging Girls in Mathematics: The Problem and the Solution, by Lorelei R. Brush, describes a longitudinal study that tracked female students' opinions about mathematics, their decisions regarding advanced mathematics courses, and their career plans at the 6th, 9th, and 12th grade levels. The author suggests ways to change girls' attitudes toward mathematics. *Available from: Abt Books, Cambridge, MA. (1980)*

Overcoming Math Anxiety, by Sheila Tobias, discusses some of the reasons why people fear learning math, such as intimidation, misunderstanding, and missed opportunities. She also provides a math anxiety scale and includes information about programs for math-anxious people. *Available from: Houghton Mifflin, Boston, MA. (1978)*

Piaget and Middle School Mathematics, by William Juraschek, applies Piaget's theory of cognitive development to middle school mathematics. The typical middle school class contains some students operating at the concrete stage, some at the formal stage, and some in transition between the two cognitive stages. Juraschek argues that the traditional teaching style of teacher lecture followed by student seatwork is ineffective, given variations in early adolescent cognitive development. Activity-based teaching is recommended, and teaching suggestions are provided. *Published in: School Science and Mathematics, 1983, 83, 4-13.*

Teachers and Sex Bias in Mathematics, by Elizabeth Fennema, presents research indicating that teachers' behaviors differentially influence males and females in mathematics education. Fennema also suggests ways to reduce sexism in mathematics education. *Published in: Mathematics Teacher, 1980, 73, 169-173.*

What Research Says: Teaching Science to Middle School Students is an article in three parts by Patricia E. Blosser. Part I discusses the cognitive, physical, social, and emotional characteristics of young adolescents and the need of middle school science teachers to respond to these developmental characteristics. Part II presents several curriculum approaches. The final article addresses the characteristics of middle school science teachers, both personal and professional, and describes a sample teacher preparation program. *Published in: School Science and Mathematics, 1983, 83, 516-523; 609-615; 694-702.*

Curricula and Instructional Materials

Connections: Women and Work and Skills for Good Jobs is a multimedia program for middle school students that addresses questions such as "Why do men and women go to work?" and "How is monetary value placed on a job?" The program also is aimed at dispelling stereotypes of "male" and "female" occupations. It includes a leader's guide; a gamebook containing lessons, exercises, and activities; and "Women at Work," a sound filmstrip and script. *Available from: EDC/WEEA (see box).*

EDC/WEEA Publishing Center

In 1974, Congress passed the Women's Equity Educational Act (WEEA) to promote educational equity for girls and women. The U.S. Department of Education has funded a variety of WEEA projects to develop materials and programs. The Education Development Center (EDC), in collaboration with the Center for Research on Women at Wellesley College, reviews, publishes, and distributes the material funded under WEEA. The EDC/WEEA Publishing Center is located at 55 Chapel St., Newton, MA 02160. Phone: (800) 225-3088 (toll-free); (617) 969-7100 within Massachusetts.

EQUALS promotes the participation of students and adults in mathematics courses and encourages their interest in math-based fields of study and work. It encompasses programs for teachers, counselors, administrators, parents, and scientific and technical workers. It also provides materials and models to improve student attitudes toward mathematics using a variety of instructional techniques. Consulting services include curriculum assessment, evaluation, and technical assistance. **Use EQUALS to Promote the Participation of Women in Mathematics** describes the teacher education program, provides methods and materials for educators, and includes annotated bibliographies on problem solving in mathematics and sex-fair counseling and instruction.

SPACES (Solving Problems of Access to Careers in Engineering and Science) is a collection of 32 math and career classroom activities designed for use in grades 4 through 10. The activities help students develop problem-solving skills while learning about mathematics-based fields of study and work. **Math for Girls and Other Problem Solvers**, by Diane Downie, Twila Slesnick, and Jean Kerr Stenmark, contains activities for children aged 7 to 13 on logic, spatial visualization, strategies, creative thinking, career awareness, and estimating and observing. The ideas presented are useful for classroom teachers, for parents and children, and for young people themselves. In addition, this book is organized so that teachers can easily identify curriculum objectives.

Family Math, a parent-child project, includes classes, materials and activities to use at home, and career information. **I'm madly in Love with Electricity and Other Comments About Their Work in Science and Engineering** is a career booklet for young people curious about the sciences that includes a list of resource people and organizations. *Contact: Nancy Kreinberg, Director, EQUALS, Lawrence Hall of Science, University of California, Berkeley, CA 94720.*

Expanding Your Horizons in Science and Mathematics: A Handbook for Planners, developed by the Math/Science Network, describes how to plan, conduct, and evaluate conferences that aim to stimulate female involvement in math and science classes. The appendix includes six workshop activities plus useful forms, samples, quizzes, etc. *Available from: EDC/WEEA (see box).*

Guide to Nonsexist Teaching Activities (K–12), by the Northwest Regional Educational Laboratory, Center for Sex Equity, contains brief annotated descriptions of lesson plans, audiovisual materials, bibliographies and resource guides, games, course outlines, and periodicals that are equitable and sex-fair. The areas covered are general awareness, fine arts, counseling and career guidance, health and physical education, math and science, social studies, and sex equity organizations. Grade levels are provided for most of the entries, the majority of which are for the junior and senior high grades. There are six appendices, including a glossary, a model for developing nonsexist lesson plans, a lesson plan activity sheet, and guidelines for developing nonbiased instruction. Although designed primarily with the classroom teacher in mind, curriculum and media specialists, librarians, coaches, administrators, and school district Title IX coordinators should find it extremely useful. *Available from: Oryx Press, Phoenix, AZ. (1983)*

The Math-Science Connection: Educating Young Women for Today is a 16mm film developed by the Math/Science Network for parents, educators, and other concerned adults. It discusses the causes and consequences of the rate of female participation in school math programs and reviews four model programs that stimulate and encourage girls and women to learn and enjoy mathematics. (Color, 18 minutes; also available as ¾" videocassette.) *Available from: EDC/WEEA (see box). (1979)*

MATHCO, developed by the Southwest Center for Human Relations Studies at the University of Oklahoma, Norman, helps girls in the middle grades feel competent about their ability to work with numbers, thus reducing anxiety. Program materials include posters, sound filmstrips, an in-service manual, and teachers guides. *Available from: EDC/WEEA (see box).*

Multiplying Options and Subtracting Bias, developed by Elizabeth Fennema, is an intervention program to eliminate sexism from mathematics education. It consists of four workshops for students, teachers, counselors, and parents. Each workshop is built around a 30-minute videotape narrated by Marlo Thomas. A facilitator's guide provides overhead transparencies, handout masters, and step-by-step instructions on conducting the workshops. (Four, 30-minute color sound videotapes [¾" videocassette, ½" open reel, VHS or Beta].) *Available for purchase from: National Council of Teachers of Mathematics, 1906 Association Dr., Reston, VA 22091. Available for rent from: Women and Mathematics Education, c/o Education Department, George Mason University, 4400 University Dr., Fairfax, VA 22030. (1981)*

Nothing But Options is an award-winning film produced by the Math/Science Network for those many teenage women who do not see how math confidence and competence can be useful in their present and future lives. Five articulate young career women, all of whom are down-to-earth, ambitious, and successful, offer information and encouragement. (17½ minute videotape; ¾", ½" VHS or Beta.) *Available from: Math/Science Network, c/o Mills College, Oakland, CA 94613. (1984)*

Sandra, Zella, Dee, and Claire, a film developed by the Math/Science Network, is intended for junior and senior high school women and men who might be interested in a career in science. An astronomer, a laser physicist, a veterinarian, and a mechanical engineer are interviewed on the job. They discuss their work, career opportunities, preparations for these and other fields, and the choices they made in their personal lives. (19 minutes, color, 16mm or ¾" videocassette.) *Available from: EDC/WEEA (see box).*

Spatial Encounters, developed at the Institute for Applied Research Services at the University of New Mexico, is a manual that contains exercises showing how various visual-spatial skills have applications in the real world of scientific occupations. The exercises, which include math, geography, acoustics, landscape architecture, and telecommunications, have clear statements of objectives and easy directions for classroom and self-directed use. *Available from: EDC/WEEA (see box).*

Women in Science is a series of videotapes that feature women with science careers, including dentistry, engineering, chemistry, computer science, geology, biomedical science, and physics/astronomy. The videotapes explore how and why the women chose the careers and the decisions they made regarding marriage and children. There also is a videotape that portrays the dilemma of a talented young woman interested in science and mathematics but discouraged from pursuing her interest by parents, peers, teachers, and counselors. Although the target audience is high school students, seventh and eighth graders would benefit from the videotapes as part of a career guidance/counseling program. (30 minutes each; color; ¾" U-matic; ½" VHS or Beta; User's Guide.) *Available for purchase or rent from: Women in Science Videotape Series, B322 School of Dentistry, University of Michigan, Ann Arbor, MI 48109. (1983)*

Women, Math, and Science: A Resource Manual, by the Center for Sex Equity in Schools at the University of Michigan, is an annotated resource list with sections on research literature; concerns of professional women in mathematics and science; programs and techniques for promoting sex equity in the classroom; curricula that promote sex equity; and organizations. Among the programs described are MATHCO and COMETS. *Available from: Dr. Charles D. Moddy, Sr., Director, Center for Sex Equity in Schools, 1046 School of Education, University of Michigan, Ann Arbor, MI 48109. (1982)*

Advocacy Resources

The **Association for Women in Mathematics** encourages women to enter and be active in mathematics and related careers, and promotes equal opportunity and equal treatment of women in the mathematical community. It has a Speaker's Bureau of women available to speak to a wide variety of audiences, including elementary and junior high school students. Members receive a bimonthly newsletter. *Address: Wellesley College, Wellesley, MA 02181.*

The **Math/Science Network** is a nonprofit corporation of over 1,200 scientists, educators, parents, community leaders, and business and industrial workers who work to promote women's participation in mathematics and science and to encourage women to enter nontraditional occupations. The Network acts as a planning resource, providing ideas, speakers, and materials, for organizations such as the National Science Foundation, the National Council of Teachers of Mathematics, and Girl Scouts of America. Network programs include "Expanding Your Horizons" conferences for secondary school young women held on college campuses throughout the U. S. (A number of Math/Science Network products are listed in previous sections of this resource list.) *Address: Math/Science Resource Center, c/o Mills College, Oakland, CA 94613.*

The **National Council of Teachers of Mathematics** is devoted to the interests of mathematics teachers and teacher educators. An information clearinghouse and resource center offers access to current materials. Publications include: **Activities for Junior High School and Middle School Mathematics**; **Arithmetic Teacher** and **Mathematics Teacher** (journals); and **Perspectives on Women and Mathematics**. *Address: 1906 Association Dr., Reston, VA 22091.*

PEER, the Project on Equal Education Rights of the NOW Legal Defense and Education Fund, works to end school practices, policies, and attitudes that limit children's choices or keep them from learning the skills they will need. Created in 1974, PEER helps parents and local community groups by offering advice, information, and in-depth training on how to initiate changes in schools. PEER publishes a number of titles, including **Equal Education Alert**, a news bulletin with up-to-date information on educational equity developments in Congress, federal agencies, and the courts, and the **Michigan PEER Math Study**, a report that analyzes math education in 113 Michigan public high schools and makes concrete recommendations for providing students with appropriate math preparation for today's high-tech society. *Address: 1413 K St. NW, 9th Floor, Washington, DC 20005.*

Women and Mathematics is a secondary school lectureship program developed by the Mathematical Association of America, which was concerned that women's inadequate preparation in mathematics would severely limit their career opportunities. The Women and Mathematics program sends women from a broad range of fields to talk to students about their careers and the importance of mathematics to their careers. The 200 speakers that are available also give presentations at career days, faculty workshops, and professional meetings, as well as to elementary school students and parent groups. *Address: c/o Department of Mathematics, University of Michigan, Flint, MI 48503.*

Women and Mathematics Education is an active networking organization that emphasizes the need for elementary and secondary programs to reverse female avoidance of mathematics. The organization also works to effect change within the mathematics education community and keeps its membership informed about issues affecting women in mathematics. Members receive a quarterly newsletter, an information brochure, and a resource list. *Address: c/o Education Department, George Mason University, Fairfax, VA 22030.*

Resources to Watch For

Challenge of the Unknown, a project of the American Association for the Advancement of Science, will focus on using mathematical problem solving in situations of interest to students in the middle grades. A series of films, microcomputer programs, and teacher notes is planned. *Contact: AAAS, 1515 Massachusetts Ave. NW, Washington, DC 20005.*

The **Computer Equity Training Project** wants to increase girls' computer use at the middle-grade level by developing school-based strategies to encourage girls to make greater voluntary use of computers. A fully tested manual for middle school personnel will be published in early Fall 1985. *Contact: Jo Suchgt Sanders, Project Director, Computer Equity Training, Women's Action Alliance, Inc., 370 Lexington Ave., New York, NY 10017.*

The **Science Resources for Schools Project,** directed by the American Association for the Advancement of Science, will prepare school science packets designed to link schools with the scientific community. Prototypes, including information, ideas, and resource materials, are being used in junior high schools in Colorado, North Carolina, and Ohio. The project's purpose is to give all students, regardless of their career aspirations, a strong foundation in mathematics and science. *Contact: AAAS, 1515 Massachusetts Ave. NW, Washington, DC 20005.*

Women and Mathematics: Balancing the Equation, edited by Susan F. Chipman, Lorelei R. Brush, and Donna M. Wilson, represents the culmination of a series of research projects, funded by the National Institute of Education, that provide the background for designing effective educational programs to encourage women to enroll in mathematics beyond minimal school requirements. The expected date of publication is August 1984. *Available from: Lawrence Erlbaum Associates, Hillsdale, NJ.*

Resources compiled by Sue Rosenzweig.

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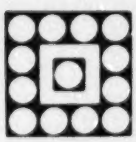

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